Australasian Plant Conservation

BULLETIN OF THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION

VOLUME 12 NUMBER 4 • MARCH - MAY 2004

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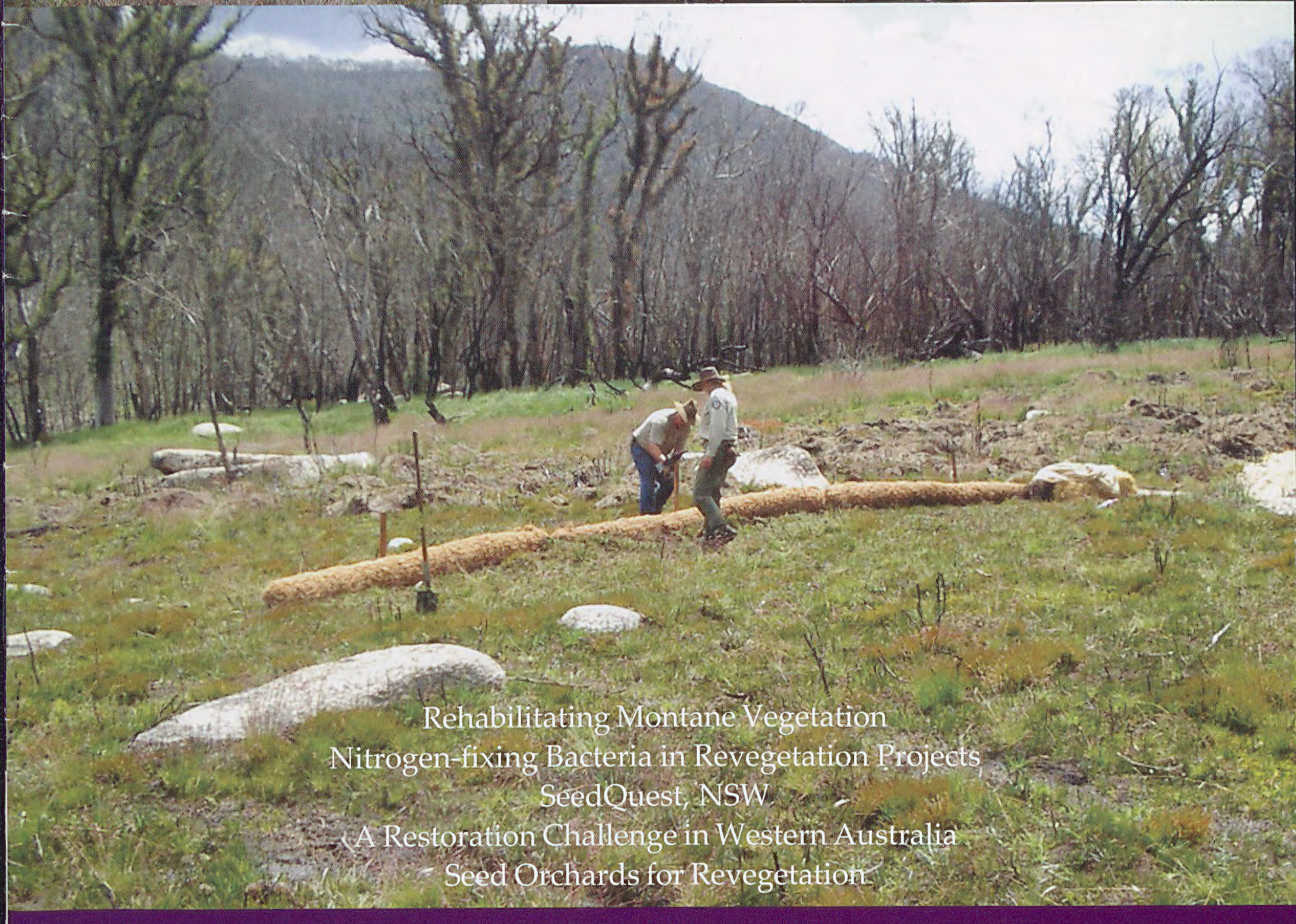

Rehabilitating Montane Vegetation
Nitrogen-fixing Bacteria in Revegetation Projects
SeedQuest, NSW
A Restoration Challenge in Western Australia
Seed Orchards for Revegetation

Special Edition - REHABILITATION

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Australasian Plant Conservation Editor

Fiona Hall, and thanks to Beth Rickwood and Tracey Armstrong

Australasian Plant Conservation is produced by the ANPC Inc. with assistance from the Australian National Botanic Gardens and TransGrid (this special edition).

Australasian Plant Conservation is printed on recycled paper.

ISSN 1039-6500

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"To promote and develop plant conservation in Australia"

Contributing to *Australasian Plant Conservation*

Australasian Plant Conservation is a forum for information exchange for all those involved in plant conservation: please use it to share your work with others. Articles, information snippets, details of new publications or research, and diary dates are welcome. The deadline for the June-August 2004 issue is Friday 4th June 2004.

Authors are encouraged to submit images with articles or information. Please submit images as clear prints, slides, drawings, or in electronic format. Electronic images need to be at least 300 dpi resolution, submitted in at least the size that they are to be published, in tif, jpg or gif format.

Please send typed or handwritten articles, no more that 2 A4 pages (or 1100 words), by fax, mail, email, or on diskette. If sending by email, please send as a MS Word (2000 compatible) or rich text format attachment to: anpc@deh.gov.au.

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Front cover: Post-fire rehabilitation work in Namadgi and Kosciuszko National Parks. Photos: Roger Good. **Back cover (from top to bottom):** Marianne Hasson plants *Grevillea dryandroides* subsp. *dryandroides* near Wongan Hills (WA). Photo: Leonie Monks; a juvenile *Allocasuarina portuensis* translocated into Sydney Harbour National Park (NSW). Photo: Paul Ibbetson; Emma Watt & Chris Todd planting *Epacris stuartii* on Southport Island (Tas). Photo: Paul Black; translocated *Acacia pubescens* at Rookwood Cemetery, Auburn (NSW). Photo: Judith Rawling; CALM staff and volunteers help plant five critically endangered plant species near Busselton, WA. Photo: Leonie Monks. **Cover design:** Siobhan Duffy

President's report

Judy West
Centre for Plant Biodiversity Research
CSIRO Plant Industry

The ANPC's busy program of activities and workshops planned for the coming months kicked off with a well-received workshop on the translocation of threatened plants at Mount Annan Botanic Gardens, Sydney, in mid-February. The more detailed report in this bulletin (see page 11) summarises the workshop contents and feedback from participants—it highlights the value of using case studies to demonstrate lessons learnt, and the importance of scenario workshops to consider need and risk assessment for any proposed threatened plant translocations.

The success of this workshop and the encouraging attendance from local government, state agencies, community groups, and some consultancy companies has led to a strong demand for ANPC to host a repeat event—now planned for Friday June 4th at the Botanic Gardens in Sydney. If you are interested in attending, please see the back cover of this bulletin, or contact the ANPC national office for more information.

Thanks to generous sponsorship from TransGrid, this issue of *Australasian Plant Conservation* focuses on the topic of rehabilitation, restoration and regeneration. The articles discuss some real practical matters, provide insight into the progress that has been made, and reveal some exciting science with pragmatic benefits for land management.

Many restoration practices need to be tailored to specific instances, and the need to focus on particular biophysical regions has been recognised with the development of the upcoming ANPC training course on Ecological Restoration of Mountain Environments (to be held at the end of April). The importance of partnerships in delivering information to the user is exemplified through this training course, with ANPC collaboratively developing a stimulating program together with the Australian Alps National Parks and TransGrid. This course will cover the elements involved in rehabilitating alpine, sub-alpine and montane environments.

As our knowledge of rehabilitation and revegetation practices advances and we learn from past experiences, it is clear that conservation management is progressively adopting more principles from functional ecology. The need to understand the biological and ecological processes operating in our ecosystems is increasingly driving partnerships between research providers and those implementing natural resource management.

As demonstrated by this bulletin, the ANPC plays a strong role in facilitating many of these interactions and bringing the results of current research findings to agencies and communities responsible for on-ground management.

Get talking about plants!

The ANPC's plant conservation email list is a great way to link up with other plant conservationists, to get answers to niggling problems about plant management or to share useful ideas and techniques. For example, recent postings have included requests for information to help prepare recovery plans for threatened species, adverts for jobs in plant conservation and announcements of forthcoming training workshops and conferences, including the many run by the ANPC.

Anyone can subscribe to the list, and as it goes out to most ANPC members, this means that there is an invaluable array of expertise out there which list users can tap into. The list is moderated by the ANPC national office, so you won't be inundated with irrelevant messages or spam!

If you'd like to subscribe or post a message, send a request to anpc@deh.gov.au

Illustration: Andrew Smith

Rehabilitating fire-damaged wetlands in the Snowy Mountains

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The January 2003 wildfires that burnt over approximately 2.5 million hectares of mountain country in south-eastern Australia caused considerable damage to the mountain vegetation communities and structural formations. Further degradation has occurred since the fires because of extensive sheet and gully erosion on areas that lost vegetation cover. The most significant damage was to the groundwater communities (bogs and fens) and the alpine and subalpine plant communities.

Impact of fire on groundwater communities

Bogs and fens play a major hydrological role by storing and releasing water to streams and rivers. But during the prolonged drought in 2002 these groundwater communities dried out and were readily burnt over by the fires. Much of the *Sphagnum* plant cover of the bogs was destroyed and large volumes of the underlying peat were burnt. The remaining peat dried out and oxidised, losing much of its water-retention capacity. Many peat-bogs and fens now support little *Sphagnum*; peatbeds are collapsing after drying out; and the most severely damaged peatbeds are being eroded by new flowlines cutting deep into the bogs and fens, further reducing their water-retention capacity and exacerbating peatbed drying.

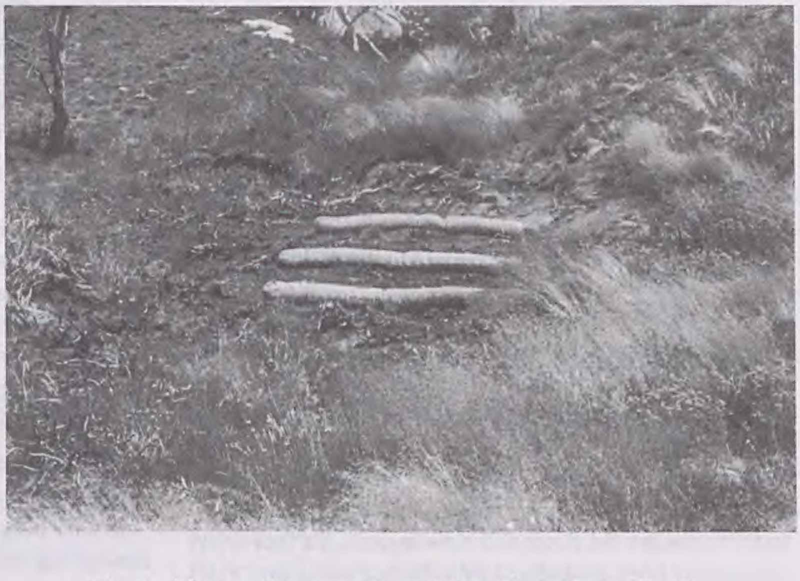
Rehabilitating alpine and subalpine bogs and fens

Considerable resources have been committed by the NSW NPWS over the past 12 months to rehabilitate these important communities. Our first goal was to quickly protect the remnant *Sphagnum* plants and to restore the peat-bogs' water-holding capacity. Experience from work done by the NSW Soil Conservation Service in the 1960s indicates that it can take up to 30 to 40 years for the hydrological function of rehabilitated bogs and fens to recover. So while our work will restore the vegetation and appearance of the many treated bogs and fens, it will take much longer for their functional hydrological role in the catchments to recover.

The techniques for rehabilitating bogs and fens and eroded and entrenched flowlines were developed in the 1960s and 1970s by the Soil Conservation Service of NSW, following the removal of livestock from the mountains. The techniques are relatively simple, and for the bogs and fens involve shading and protecting remnant plants, particularly *Sphagnum* species, from drying out; building hay bale dams and absorption trenches; and placing coir and hay-filled jute mesh 'logs' as surface water-spreaders and sediment traps. The most important step in the rehabilitation work is to slow surface flows. This allows sediment to be deposited; creates pools of surface water around which *Sphagnum* can regenerate and allows the hydrologic regime of the bog to begin to recover. After creating the flow-control structures, sods of *Sphagnum* and *Carex* species are planted into them. This hastens the recovery of these species and also assists the organic materials (hay bales) to break down and be incorporated into the remaining peat.

We have been restoring the extensive sheet erosion areas by enhancing natural regeneration by planting in sods of native species; applying slow release complete fertilisers; and mulching the most severely burnt areas with sterilised weed-free pasture hay. Coir and hay-filled jute mesh logs have been pinned down on the contour to act as water-spreaders and to slow runoff.

As with the bogs and fens, where stream entrenchment has occurred we built hay bale dams in the streams to act as silt filters and to create pools of still water where *Carex* and *Sphagnum* species and other water plants can establish. In some pools silt has already been deposited and *Carex* sods have been planted into the sediment fans.



Jute mesh logs acting as sediment traps. Photo: Roger Good

Where streambanks have been undercut we have positioned coir logs along the banks to prevent further undercutting and lateral extension of the erosion, to support the streambanks and to prevent further collapse of riparian vegetation. We planted sods of *Carex* and *Sphagnum* along some sections of entrenched streams and shaded them with mulching hay.

Summary

The successful rehabilitation of damaged alpine and subalpine soils and plant communities requires an understanding of the functional role of the various communities being treated; an understanding of the ecological requirements of the significant plant species of each community; and an appreciation of the level or degree of degradation of each community. At the extremes of degradation, rehabilitation to the pre-fire community may not be possible and restoration to some other stable vegetation state, e.g. fen to sod-tussock grassland, may be all we can achieve.

Where rehabilitation is identified as possible the techniques to restore the communities to their pre-fire condition can be relatively simple and readily implemented, although full rehabilitation of their functional role may take several decades of careful maintenance and management.

In the next article Jane Burkitt outlines a monitoring program for assessing the success of these wetland restoration efforts.

Monitoring rehabilitation of a *Sphagnum* bog in the Snowy Mountains, NSW

Jane Burkitt

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Some 40 years ago, a large *Sphagnum* bog in the Kosciuszko National Park in New South Wales was the site of a very significant study of the water balance in mountain catchment bogs and fens. The inflow to the bog from a small stream and several springs feeding it was monitored over a five year period. The study assessed and evaluated the water balance of the bog (inflow against outflow), the water retention capacity, the vegetation and associated issues of energy and snowmelt.

The study area is in the upper Pipers Creek valley, a tributary of the Snowy River. The whole of upper Pipers Creek lies within the sub-alpine area, which is characteristically snowgum (*Eucalyptus niphophila*) woodland on the slopes with the valley floor being occupied by fen and valley bog communities. The study site at the time (1969), covered 2511m^2 at an elevation of 1646-1656m. It is one of the most significant bogs in the Pipers/Prussian Creek catchment. The bog is supplied by water from two springs, as well as by a small surface flow upslope from the bog. The spring water flows through the bog and *Sphagnum* moss cover to a roadside culvert on its downhill edge. The Sphagnum moss covered about 1502m^2 of the total area of the bog.

Today the size and hydrology of the bog has altered because of the widespread wildfires which burnt over much of Kosciuszko National Park in 2003. This has led to a loss of the *Sphagnum* moss, destruction of much of the peatbed and a change in the bog vegetation. The bog subsequently dried, and the NSW NPWS have started rehabilitating it to try to restore the water and flow regime. Surface water flows have been re-directed into the bog using hay bales and shallow trenches. The small weirs built for the original study to measure inflows to the bog have been restored and a new outlet weir will be constructed to measure the discharge from the bog.

From the previous study we know the extent of the moss-bed, the cross-sectional profile of the bog and the daily inflows and outflows. This provides us with a rare opportunity to examine the consequences of wildfire on a specific groundwater community and to monitor how it responds to rehabilitation. We will assess the extent to which the hydrological regime returns to its former undisturbed state.

This summer we are completing detailed vegetation mapping of the bog, plus an assessment of the catchment condition in the immediate vicinity. In late summer we will survey 10 vegetation transects across the bog to assess changes in species over time and this will be repeated in spring, mid-summer and autumn for at least five years. Every year we'll carry out peat depth and cross-section profiling of the bog to assess changes in the peat volume and water-holding capacity. Data loggers for stream flow, water conductivity and water temperature will be installed at the inflow and outflow weirs. A recording pluviometer (automatic rain gauge) and a radiometer (solar radiation) will be installed within the bog area and wet and dry bulb thermometers will be housed in a Stephenson screen next to the bog.

This study will allow us to assess the benefits of implementing a range of rehabilitation techniques in damaged bogs, and the rate of recovery of disturbed and damaged groundwater communities.

Use of nitrogen-fixing bacteria in revegetation programs

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A major conservation focus in Australia is restoring native vegetation and replanting tree cover. For land managers, however, replanting with native vegetation is not a simple task. There is a lack of scientific knowledge to assist them which often results in costly and failed ventures.

One of the characteristic features of most Australian soils is their low fertility, particularly nitrogen deficiency. This means that partnerships between plants and soil organisms, such as root-nodule forming bacteria (rhizobia), mycorrhizal fungi and actinomycetes (*Frankia*), have particular significance for conservation management and restoration of degraded ecosystems. For example, rhizobia can take atmospheric nitrogen and turn it into available nitrogen in the soil which acts as a fertiliser. However, accumulating evidence is now showing that the diversity and abundance of soil organisms such as native rhizobia have declined dramatically in temperate Australia through the removal of native trees and shrubs, cultivation of paddocks and increased soil acidity (Figure 1).

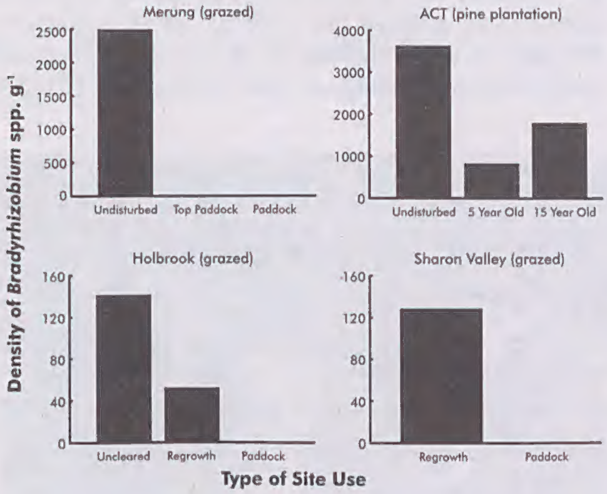

Figure 1: Density of Bradyrhizobium *bacteria per gram of soil in a range of field sites representing different degrees of human impact.*

In nitrogen-deficient environments, the prompt formation of an effective symbiotic association between rhizobia and legumes secures a reliable source of nitrogen that promotes rapid early seedling growth for the host plant. Ineffective associations result in little or no growth (Figure 2). Rapid early growth is essential for effective establishment, especially in environments characterised by low fertility, the threat of drought and/or competition from weeds. This leads to higher rates of long-term establishment and thus better outcomes for revegetation programs. Importantly, earlier findings indicate that the presence of wattles growing in symbiosis with helpful strains of rhizobia also benefits other plants growing nearby, like eucalypts.

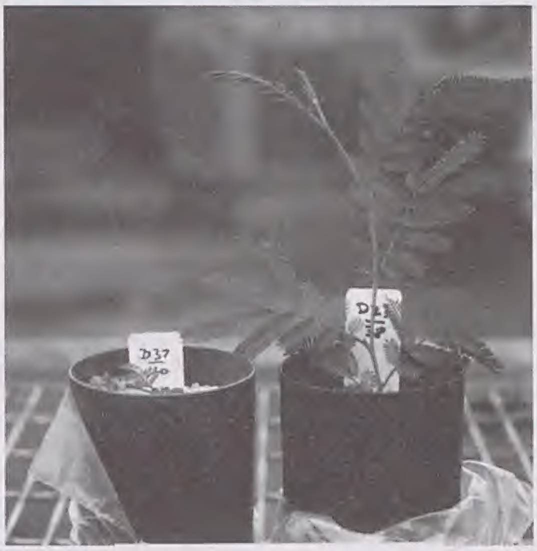

Figure 2: Example of the extreme differences in growth performance that are commonly observed in greenhouse inoculation studies. This photo of Acacia dealbata *was taken 12 weeks after seedlings were inoculated. The plant on the left was inoculated with a rhizobial strain that had been shown to be very poor at promoting host growth (i.e. parasitic), while the plant on the right was inoculated with a strain that had been characterised as 'elite' (i.e. very effective in nitrogen fixation and promoting plant growth). Photo: Matt Woods*

Although the importance of rhizobial interactions is very well recognised in conventional agriculture, they have been grossly under-utilised in developing better approaches to the rehabilitation and restoration of natural systems. At CSIRO Plant Industry we have demonstrated that growing wattles with a soil bacterium called *Bradyrhizobium* improves their chances of survival and increases their growth rates. *Bradyrhizobium* is a genus of root-nodule bacteria with which essentially all native Australian legumes form nodules and fix nitrogen. This includes a large number of shrubby legumes in the Mimosaceae (*Acacia*) and Fabaceae (e.g. *Daviesia*, *Dillwynia*, *Oxylobium*, *Hovea*, *Pultenaea*). These plant taxa, particularly *Acacia* species,

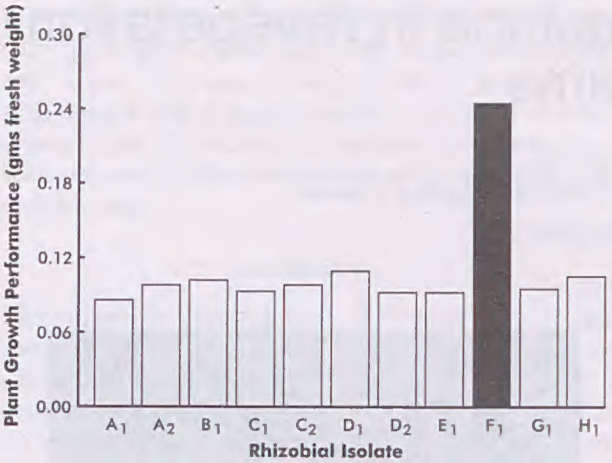

Figure 3: Growth response of *Acacia cincinnata* when inoculated with its own rhizobial isolates (soild black bar), versus growth performance with a range of isolates derived from other *Acacia* species

are found throughout Australia, and frequently dominate undisturbed ecosystems in abundance as well as overall biomass. Indeed, the Fabaceae represent about 10% of all native plant species in Australia.

Working in collaboration with the Department of Primary Industries–Victoria, the North Central Catchment Management Authority and Greening Australia Victoria, we set up a number of large scale field trials in north-central Victoria. These trials showed that direct seeding of wattle seed inoculated (covered) with *Bradyrhizobium* have establishment rates 2 to 5 times better than untreated seed.

We have also examined the degree to which host specificity relates to abundance and distribution of rare *vs.* common *Acacia* species. The results indicate that, at least in some cases, rare species are less likely than common species to nodulate and fix nitrogen with a broad range of isolates (Figure 3). This factor should also be taken into consideration in revegetation programs.

CSIRO Plant Industry is currently arranging with Bio-Care Technology Pty Ltd to commercialise inoculants containing strains of *Bradyrhizobium* that are highly effective at promoting growth in a range of acacias. These will be commercially available in mid-2004. The inoculant will be able to be spread over wattle seed prior to planting, either on seed that will be used in nurseries to establish seedlings, or on seed that will be used for direct seeding. The direct seeding application is seen to have the most advantages as large areas can be replanted cheaply and easily. It will be suitable for a range of south-eastern Australian wattle species, including some salt tolerant ones.

Further reading

Murray, B.R., Thrall, P.H. & Woods, M. (2001) Do rare *Acacia* species demonstrate greater specificity for rhizobial symbionts? Implications for restoration of native vegetation. *Ecological Management and Restoration* 2, 213-219.

Thrall, P.H., Murray, B.R., Watkin, E., Woods, M., Baker, K., Burdon, J.J. & Brockwell, J. (2001) Bacterial partnerships enhance the value of native legumes in revegetation and rehabilitation of degraded agricultural lands. *Ecological Management and Restoration* 2, 233-235.

SeedQuest NSW: a partnership for conservation

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An important part of the conservation and restoration of plant communities is sourcing seed of known provenance and good quality. A new partnership has been developed between the Botanic Gardens Trust (BGT) and Royal Botanic Gardens, Kew to seedbank a significant portion of NSW species. Importantly, this partnership, through a process of research and regular assessment, will ensure that the collections that are made have significant conservation value.

The partnership project, SeedQuest NSW, aims over the next six years or more, to collect, process, research and store 25% of NSW species. Seeds will be held in the NSW Seedbank, located at Mount Annan Botanic Garden, as well at Kew's Millennium Seedbank (MSB) at Wakehurst Place in Sussex, south of London. This is part of a global biodiversity risk management strategy that includes a number of Australian partners. Seeds of NSW species deposited in the NSW and Millennium seedbanks will be stored and regularly tested for viability. It is expected, based on research on similar species, that after undergoing moisture reducing treatments, seed of most species can be stored at sub-zero temperatures (-18°C) for centuries, perhaps millennia.

Seeds of NSW plant species. Photo: Jaime Plaza

The Botanic Gardens Trust is identified in the NSW Biodiversity Strategy as a lead agency in providing ex situ seed conservation options for New South Wales plant species and communities. Consequently, the NSW Seedbank is the main repository of New South Wales threatened species seed and has one of the most diverse collections in Australia of Australian native species, containing over 7000 accessions representing approximately 4000 taxa which are predominately collected from the wild. The aim of the SeedQuest project is to ensure that a wide range of species, especially threatened species and components of threatened communities, are included in the collection. Not only will they be part of the collection, but the aim is to further the understanding of the seed biology of these species. In turn this may inform the processes of in situ management, restoration and recovery. Seedbanking also provides insurance against the loss of genetic diversity from natural populations through threatening processes and catastrophic events.

The purpose of the NSW Seedbank is to provide the capacity for the long-term storage of seed from across all bioregions of the state, including common species as well as those listed under the *NSW Threatened Species Conservation (TSC) Act* (1995). The core seed collections in the NSW Seedbank are the 'common' species, those species that may often be taken for granted, because at present they are under little threat. However, they are important for a number of reasons. Understanding such species may inform us about ecosystems and their management. Also, sadly, species that were once common may decline in extent through various processes and become restricted, less frequent and over time may disappear.

The capacity of the NSW Seedbank to effectively store a range of rare and threatened species has been further enhanced and accelerated through a recent review of its existing threatened species collections (funded by the NSW State Biodiversity Strategy). The partnership builds on existing seed conservation programs with NSW Seedbank procedures for threatened species being refined and improved through the review process. A database is being developed to help with record keeping, data analysis, species prioritisation and identification of taxa requiring collection. The database will be a powerful information store that will enable more efficient and effective strategic planning, in relation to threatened species, for the NSW Seedbank. The germinability and storability of a number of NSW threatened species have now been documented and many more will be tested over the coming years. This work will help inform recovery planning and ensure that the NSW Seedbank is providing the most appropriate conditions for the long-term storage of a wide range of species.

Signing of the SeedQuest NSW agreement in November 2003 between Royal Botanic Gardens Kew and Botanic Gardens Trust, from left to right at back Tim Pearce (MSB), Cathy Offord (BGT), Peter Cuneo (BGT), at front Professor Peter Crane (Director RBG Kew) and Dr Tim Entwisle (Director BGT). Photo: Natasha Vulelja

More information

http://www.rbgsyd.nsw.gov.au/conservation_research/plant_conservation/nsw_seedbank

http://www.rbgkew.org.uk/msbp/

http://www.nationalparks.nsw.gov.au/npws.nsf/Content/SBS+Home

Eliza's changing face: a restoration challenge in Kings Park and Botanic Garden, WA

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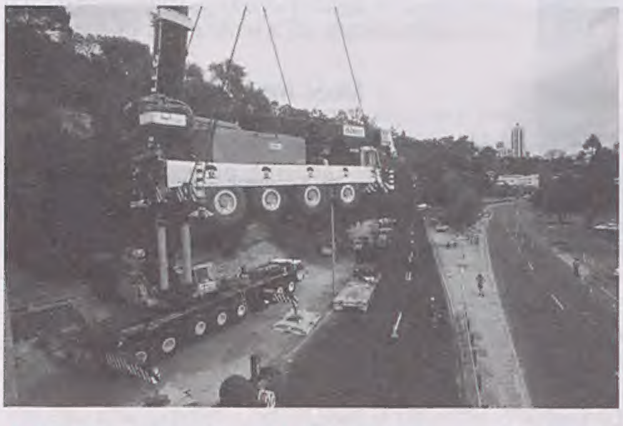
The Mt Eliza Escarpment in Kings Park and Botanic Garden is a steep limestone cliff that rises 70 metres from the Swan River and is just one kilometre from central Perth. Its 17 hectares support a remnant limestone heath community, which is poorly represented in the Perth region.

The scarp has a long history of disturbance and has become considerably degraded by limestone quarrying and terracing of the slope, timber extraction, access track construction, fire and planting introduced species for landscape beautification. Not surprisingly, this has resulted in the loss of indigenous vegetation cover, weed invasion and a decline in biodiversity. Slope stability has also been affected, with landslips and rockfalls raising concern for public safety. An initial geotechnical report on the scarp recommended a combination of engineering controls and appropriate revegetation of the slope to improve its stability.

In 1996 funding from WMC Resources Ltd got the Mt Eliza Escarpment restoration project going. This funding was significantly boosted in 1998 with a state government commitment to the project of $4.3 million over five years. The broad objectives of the project are to achieve ecosystem recovery through ecological restoration, while preserving cultural heritage and improving slope stability and public safety.

As little was known at the time about ecological restoration on such steep and unstable slopes, we needed to carry out some research into the best techniques to use. Several researchers, operations staff, students and volunteers were involved in the research phase, which combined research with trial sites along the scarp to test restoration techniques.



A 400 tonne crane is used to lift a 70 tonne crane into a less accessible area for tree removal. Photo: Peter Moonie

Three years of research culminated in the Mt Eliza Escarpment Restoration Plan (Meney, 1999), which we started to implement the same year.

Weed removal

As with most restoration projects in degraded sites, weed removal and control presented a significant challenge on the scarp. In addition to invasive weeds such as bridal creeper, bridal veil, perennial veldt grass and a range of bulbous weeds, the scarp hosted a range of woody weeds. These included non-local eucalypts, Geraldton wax, peppermints and pines, many of which had been planted for landscape beautification, including over 300 mature trees. Research had shown that in addition to their invasive nature causing loss of biodiversity, these mature trees were contributing to slope instability by fracturing the limestone and displacing the fine rooted native species that bind the soil surface.

Adding to the removal challenge was the severe slope—greater than 45 degrees in some areas—and the presence of a major road into the city at the base of the scarp. Contractors used cranes to remove the trees in sections to minimise disturbance and most of the material was chipped and used for mulch elsewhere in the park.

Another major weed problem was the extensive invasion of the century plant, *Agave americana*. We used various methods to remove this, including machinery in the more accessible locations and manual removal in other areas. More than 600 cubic metres of *Agave* have been removed so far.

We are controlling herbaceous weeds by using selective herbicides at rates identified through research. This is an ongoing process, particularly with the more persistent species such as bridal creeper, bridal veil and emerging successional species.

Slope stabilisation

Stabilising the slope was another major challenge. We trialled some bioengineering techniques (organic fibre matting pegged to the surface, followed by replanting) to hold the surface soils in place in steep areas until the fine rooted plants began to take over from the matting. These have proven very successful and we have used them widely along the scarp. Staff were trained to use harnesses and fall arrestors anchored at the top of the slope to increase safety.

Before and after photos of restoration of one of the steeper slopes. Photos: Thomas Schwarten & Peter Moonie

We used alternative techniques such as limestone spalls (rocks used to slow the flow of water), fibre matting, brush laying and planting to combat gully erosion where runoff was concentrated in one location. We also installed new drainage and soakwells at the top of the slope to collect surface water from the developed areas above and reduce runoff over the slope.

Revegetation

Revegetation with indigenous species helps stabilise the slope and is also ecologically desirable. Natural recruitment of local species on the site is limited due to its disturbance history, so we supplemented this with planting. We trialled direct seeding on the gentler slopes but our research showed that planting seedlings was more appropriate over most of the site. The species mix aimed to reinstate species richness for the long-term sustainability of the limestone heath community and its associated fauna and to enhance slope stability. We made a core list of 35 species initially, which has since been extended to over 70 species after resolving propagation difficulties through further research.

The most valuable species for stabilising the shallow soil layer over the limestone are the fine rooted tussock plants such as *Conostylis aculeata* and *Acanthocarpus preissii*. Other species of interest include *Acacia pulchella*, which is planted extensively as a pioneer plant to help enrich the soil for subsequent plantings of species that are harder to establish. *Templetonia retusa* (cocky's tongue) is also useful for soil binding and has showy red flowers as a bonus.

To ensure correct genetic provenance of the plant material, we collect seed of most species from the site and supplement this with seed from alternative locations, mostly after testing the DNA of the material. The need for DNA testing of externally collected material was demonstrated when *Conostylis* was planted from an external source and later DNA testing revealed a different genetic composition from the local provenance material. We are now monitoring these plants for reproduction and hybridisation with the remnant population, as well as looking at their survival success. If their impacts are deemed detrimental, they may have to be removed in the future.

The planting program is another challenge for the project. With up to 80,000 seedlings to be planted each year and the planting timeframe limited to June and July due to seasonal constraints, a massive effort is required to get the planting done as efficiently as possible.

Many volunteers from community groups, corporate groups, employment programs and interested individuals have contributed to the success of the project and helped to keep the project costs down. Volunteers mostly plant the gentler slopes for safety reasons, leaving the steeper slopes for trained staff. Once again fall arrestors have been an invaluable method for increasing safety while planting, with staff descending the slopes in harnesses, carrying plants in kidney baskets and planting with small trowels.

So far more than 320,000 plants have been planted. We have an extensive monitoring program in place to record survival and provide information for future infill planting. Rare fauna populations (land snails and trapdoor spiders) are also monitored periodically to evaluate the success of conservation strategies.

Conclusion

The challenges of this project have been unique in many ways due to the terrain, the location and the nature of the risks involved. Although at first glance the project funding may appear high for a public restoration project, when the scale of the project and its unique circumstances are taken into consideration, the high costs can be more readily understood. In addition, the scarp restoration project serves as a demonstration site for world-class ecological restoration with research outcomes, operational techniques and principles applicable to other restoration projects with broad community benefits.

Reference

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Rehabilitating the TransGrid transmission lines in the Snowy and Brindabella Ranges

Stuart Johnston[1] *and Roger Good*[2]

[1]*TransGrid and* [2]*National Parks and Wildlife Service. Email: roger.good@npws.nsw.gov.au*

In February and March 2001 contractors for TransGrid, as part of a vegetation maintenance program, cleared extensive areas of two powerline easements crossing Kosciuszko and Brindabella National Parks in New South Wales and Namadgi National Park in the ACT. The result was a swathe of cleared easement over a distance of some 70km. While the total area cleared was less than 200 hectares, damage was considerable in terms of the destruction of habitats and the potential for erosion and stream sedimentation. The cleared swathe also detracted from the aesthetic values of the mountain landscapes within the parks.

The rehabilitation challenge

The clearing of the vegetation and the disturbance and removal of much of the topsoil from the easements presented a significant rehabilitation and revegetation challenge for TransGrid, the National Parks and Wildlife Service and NSW Soil Services, who were contracted to undertake the initial stabilisation works. We needed to ensure that the work carried out and the end result were in sympathy with both the national parks' management objectives and the maintenance needs of the transmission line easements. The restoration required an appreciation and understanding of montane and subalpine soils and vegetation and the ecological processes that sustain native vegetation in those zones. For example, at the higher elevations, subalpine humus soils occur and these can only support woodland and shrub communities by rapid recycling of nutrients through the decomposition of the soil surface litter and organic matter in the soil itself. Any removal or disturbance of this process, as occurred with the clearing of the easements, would affect the potential capacity to revegetate the sites.

Our aim was to fully revegetate the easements with indigenous native species of a structural type that would allow easement maintenance to continue. We had to bear in mind that the revegetated area would continue to be disturbed by recreational and powerline maintenance vehicles. We also wanted native vegetation cover to link the woodland areas either side of the easements, but because of the height limitations of any restored vegetation this would not necessarily represent its original natural state.

Another factor that had to be taken into account was the endangered northern corroboree frog (*Pseudophryne pengillii*) which had been recorded in several swampy and wet sites along the easement. The frogs disperse into the surrounding grasslands and woodlands during autumn for over-wintering, so this was the best time to do the wetland habitat rehabilitation.

The revegetation program started in May 2001 and ended in September 2003 (apart from some minor works and a weed control program which are still to be implemented). We first replaced as much of the topsoil as possible from the piles which had been pushed up along the edge of the easements. We then assessed the soil and micro-climatic conditions and developed a program for each terrain, altitude and soil type/condition.

We sowed an initial soil stabilising crop of sterile rye corn, which we mulched with straw at the rate of approximately 8 tonnes per hectare. This depth of mulch insulates the soil from cold ambient temperatures and frost-heave action

Starting the rehabilitation work. Photo: Roger Good

18 months later: early regeneration. Photo: Roger Good through winter and early spring. A minimum of 6 to 10 tonnes per hectare of mulch has also previously been found necessary to protect the transitional subalpine humus soils on slopes steeper than 7 degrees from runoff and soil erosion. Most of the cleared landscape is on slopes steeper than 15 degrees.

Once stabilised, all areas were sown with seed collected from native shrub species from nearby sites that grow to a maximum height of 1.5 to 2 metres. These species were mostly leguminous species (*Daviesia, Hovea, Oxylobium* and *Pultenaea* spp) which are adaptable to many site conditions. Future ecological maintenance programs will include planned burning to promote more leguminous shrub species through scarification of soil-borne seed reserves, while suppressing regenerating eucalypt species. Where soil conditions were not conducive to regeneration from seed, we planted approximately 300,000 tubestock of native shrub species.

A monitoring opportunity

Much has been gained from this opportunity to apply ecological restoration principles to the revegetation program and to develop sound management and maintenance programs for the easements. It has been an ideal opportunity to assess the techniques used and to monitor the cleared areas as they recover to a stable and manageable native vegetation cover. The sharp vegetation and habitat boundaries that now exist between the natural bushland and the cleared easements also provide an opportunity to study this ecotone. The long-term monitoring of the rehabilitation and revegetation work will also enable ecologically based management programs to be implemented as standard powerline easement management in the future. For example, TransGrid's future maintenance programs will account for the ecological requirements of native vegetation through a range of treatments like slashing and periodic planned patch burning, replacing the past singular objective of mechanical vegetation clearing.

ANPC workshop on the translocation of threatened plants

Translocation, the deliberate transfer of plants or regenerative plant material from an ex situ collection or natural population to a location in the wild, if implemented effectively, may assist in the conservation of threatened species. However, despite the potential benefits associated with translocation, it is a complex, time consuming and resource intensive process that does not come without risks. The ANPC is currently revising its 1997 guidelines on the translocation of threatened flora (Translocation Working Group, 1997) and held a workshop summarising the contents of the second edition (Vallee et al., in prep) which will be released in June 2004 (please contact the ANPC national office to buy a copy). This workshop was held at Mount Annan Botanic Garden, NSW on 17th February 2004 and was supported by the Botanic Gardens Trust and NSW Environmental Trust. It was targeted at those involved in the planning, approval or implementation of translocation projects for threatened flora. The workshop was attended by 86 people including a wide range of stakeholders from around the country, with 28% of participants working for local government; 22% for commonwealth government; 19% for state government; 16% for environmental consultancies and the remaining 15% made up of non-government conservation organisation staff, community group members and interested individuals.

Topics covered included:

- deciding whether to translocate (presented by Tricia Hogbin, Department of Environment and Conservation, NSW)
- pre-translocation assessment, planning and preparation (Leonie Monks, Department of Conservation and Land Management, WA)
- implementation and ongoing management, monitoring and evaluation (Maria Matthes, Department of Environment and Conservation, NSW)
- community group involvement (Bob Makinson, Botanic Gardens Trust, Sydney)

Leonie Monks (Department of Conservation and Land Management, WA) and Judith Rawling (Urban Bushland Management Consultants Pty Ltd, NSW) presented some case studies highlighting lessons to be learnt from past translocation programs. The afternoon was spent in smaller groups working through fictional scenarios where much debate occurred on whether to translocate and what the alternatives to translocation were. The question of whether to translocate, and consideration of alternatives, is particularly important given that in recent years there has been an increasing number of inappropriate, poorly planned, and poorly resourced translocation programs implemented as a compensatory measure for development.

We got very positive feedback from the participants (see President's Report, page 2, and viewpoints below). Given the success of the workshop, and as we now have a long waiting list for another Sydney workshop, we will hold a repeat workshop at the Royal Botanic Gardens, Sydney in June to coincide with the launch of the revised ANPC

Translocated Grevillea scapigera *individuals in WA. Photo: Bob Dixon*

Translocation Guidelines (see back cover of this bulletin). There are also plans to hold the workshop in Western Australia, Queensland and Victoria. If you feel this workshop is required in your area, or if your organisation is interested in hosting or sponsoring a workshop, please contact the ANPC national office.

Viewpoints

We asked participants representing local and state government, the private sector and a non-governmental organisation to briefly comment on the workshop. In particular we asked these participants how the translocation of threatened flora is relevant to their work and how the workshop contributed to their understanding of translocation. Their reports are below.

Jamie Slaven (Hornsby Shire Council)

My main role at Hornsby Shire Council is to assess development applications for their impact on native flora and fauna. In the DA process I have to consider ameliorative options either suggested by the developer or as council's conditions of consent. In the case of threatened flora, translocation can often be the developer's preferred option.

Before the workshop I was aware that translocation is not a recommended option for development. By attending this workshop I was able to obtain the latest information on the translocation of threatened species from experts involved in the preparation of the second edition of the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al., in prep.), as well as hear about case studies on successful and unsuccessful translocation projects.

The workshop has made me aware of the complexity of translocation of threatened species and that the initial decision to translocate requires careful consideration. Lack of compliance and monitoring were identified as key areas which often fail with developments.

Deb Stevenson, Department of Environment and Conservation, NSW

As a threatened species officer, I am most familiar with translocation of threatened plants in the context of the development assessment and approval process. Translocation is viewed by many proponents, consultants and consent bodies as an ameliorative measure which can reduce the impacts of development to an 'acceptable' level. Development consent becomes conditional on translocation and the DEC becomes an unwilling participant, either through the licensing process for off-site translocations or because consent conditions stipulate that translocation is to be undertaken to the 'satisfaction' of the DEC. I have had indirect involvement with two such translocation attempts and both have failed. The workshop confirmed my view that translocation of threatened species is a complex, time-consuming and costly process with little guarantee of success. Ameliorative translocation is *not* an alternative to in situ conservation and should only be used as a last resort when all other avenues (e.g. avoidance and mitigation) have been exhausted.

Selga Harrington, Botanist, Biosis Research, NSW

As an environmental consultant I often undertake pre-development flora surveys. When a threatened species, population or community occurs within the footprint of a proposed development, we make recommendations for how to avoid or minimise the impact on threatened flora. Where impacts can not be avoided, we propose compensatory or ameliorative measures and translocation might be suggested as a possibility. Sometimes the investigation of translocation potential is a condition of consent required by local or state government.

The workshop outlined the ANPC's revised translocation guidelines. These include detailed guidelines and checklists for deciding whether to translocate and they make the distinction between translocation for conservation purposes and translocation as a pre-development salvage. The workshop also provided a deeper understanding and appreciation of the other stages of the translocation process including planning, implementation and monitoring which were particularly well illustrated through case studies.

Samantha Craigie, Greening Australia NSW (Greening Western Sydney Project)

Greening Western Sydney is reluctant to recommend plant translocation projects because of the many complexities of the undertaking. Past experience has yielded poor results or submitted proposals been considered too costly by potential clients. Factors such as the availability of suitable recipient sites and the inability to install appropriate security measures have proven to be decisive factors in translocation success or failure in Western Sydney.

The translocations that have been undertaken have been initiated opportunistically and from a perspective of genetic conservation rather than as a means to expedite development consent. Some success has been recorded with plant rescues where the salvaged flora have been returned to our nursery to be used for future revegetation.

The ANPC workshop provided detailed information about the various stages of the translocation process and a framework for appraising proposals. It has also vindicated Greening Australia's position of avoiding translocation projects, except where adequate funding is available. Our policy of suggesting alternative actions, such as in situ conservation, is in keeping with best conservation practice.

Subscribe to the ANPC email list (see page 2 for details), if you want to be kept updated on forthcoming ANPC workshops.

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Vallee L., Hogbin T., Monks L., Makinson B., Matthes M., and M. Rossetto (in prep). *Guidelines for the Translocation of Threatened Plants in Australia.* Second Edition. Australian Network for Plant Conservation, Canberra.

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SYDNEY

Seeds of the future

Paul Scannell

Albury Botanic Gardens. Email: pscannell@alburycity.nsw.gov.au

The NSW South West Slopes and the Murray Catchment contain some of the most highly cleared and modified landscapes in south-east Australia. Our vegetation ranges from sub-alpine heath, through the box gum woodland and buloke of the hills, to grassy box woodland and wetlands on the Murray floodplain, which stretches through to the mallee areas in the west.

Last year the Murray Catchment Management Board published a 'Blueprint' for actions to address the four major issues in the area: salinity, soil acidity, water quality and biodiversity (DLWC, 2003). This includes targets for revegetating some 5,000 hectares every year for the next 50 years. By 2052, almost 30% of the catchment should have been revegetated.

To achieve these targets a vast amount of native seed will be needed. But collecting such volumes from the wild may do more long term damage than good. To overcome this problem AlburyCity, in partnership with the Wandoo Aboriginal Corporation Nursery, are building seed orchards to provide a sustainable seed source for wetland species, and food and habitat plants for threatened bird species. Of particular importance are the species which form the understorey in woodland habitats. These seed orchards will also ensure that the seed used for revegetation is of local provenance. The project has been made possible through a funding grant from the Environmental Trust Community Grants program of $50,000.

Seed orchards will help take pressure off threatened species like Caladenia concolor. *Photo: Anita Madrau and Rebecca Chettleburgh*

Threatened species that the understorey seed orchards will help include black chinned honeyeater, brown treecreeper, bush stone-curlew, squirrel gliders, barking owl, regent honeyeater, diamond firetail and pink tailed worm lizards. They will also take the pressure off threatened plant species like *Caladenia concolor* and *Senecio garlandii*, which are possibly threatened by wild seed collection.

White Box, Yellow Box, Blakely's Red Gum Woodland is an endangered ecological community in NSW, and Grassy White Box Woodland *(Eucalyptus albens)* is a nationally endangered ecological community. Much of the Albury region's remnant vegetation falls within these categories. This project aims to manage this remnant vegetation for conservation of both flora and fauna by providing the seed to restore these remnants to their former complement of species. It will also help prevent over harvesting of remnant vegetation areas. For example, Nail Can Hill is one of the few remaining local areas for many of our understorey species to be collected from and collecting in the wild may cause damage to threatened plant species through trampling by enthusiastic volunteers.

It is envisaged that the seed orchards will be created this year and the first seed will be collected in November 2004. The Murray Indigenous Seed Service, which runs four seedbanks in the catchment, will be able to access the seed for local farmers, nurseries, contractors and landcare groups. AlburyCity and nursery staff will gather information from many sources to ensure the best possible outcomes are achieved.

This project will provide employment and training for indigenous staff in land management, and will also create business opportunities for Wandoo Nursery in sourcing seeds and providing native trees and shrubs.

Reference

DLWC. 2003. *Integrated Catchment Management Plan for the Murray Catchment 2002*. Dept. Land and Water Conservation, NSW.

http://www.dlwc.nsw.gov.au/care/cmb/blueprints/pdf/murray.html

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Update from the New Zealand Plant Conservation Network

John Sawyer

Secretary, New Zealand Plant Conservation Network, info@nzpcn.org.nz, www.nzpcn.org.nz

The New Zealand Plant Conservation Network has continued to grow since its inaugural meeting in Wellington, New Zealand in August 2003. The Network now numbers approximately 150 members from five countries. Members include landowners and professional and amateur botanists, plus representatives of botanic gardens, zoos, universities, local councils and government departments.

A document summarising the results of workshops on implementing the Global Strategy for Plant Conservation in New Zealand is now published (see photo) and has been distributed by email to network members. Please contact the network if you want a copy emailed to you (hard copies cost NZ$10).

We continue to develop the network's website (www.nzpcn.org.nz) in the knowledge that over 1,000 people visit the site each month.

We have submitted funding bids to develop an internet-based Fungal Conservation Information System and to prepare a plant conservation training course for *iwi* (Maori tribes) to be delivered at *marae* (a place where Maori gather) throughout New Zealand.

We will put in further bids for money for implementing projects identified by network members at the inaugural meeting. Those projects include a stocktake of plant conservation education programs in New Zealand and a review of legal protection mechanisms for indigenous plants.

Research Roundup

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Miller, B., Conway, W., Reading, R. P., Wemmer, C., Wildt, D., Kleiman, D., Monfort, S., Rabinowitz, A., Armstrong, B. and Hutchins, M. 2004, **Evaluating the conservation mission of zoos, aquariums, botanical gardens and natural history museums.** *Conservation Biology*, 18, 86-93.

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"Some species of plant will prefer a world with higher levels of atmospheric carbon dioxide. When those species are invasive pests, the invaders may well flourish at the expense of the native vegetation."

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Peakall, R., Ebert, D., Scott, L., Meagher, P. and Offord, C. (2003). **Comparative genetic study confirms exceptionally low genetic variation in the ancient and endangered relictual conifer, *Wollemia nobilis* (Araucariaceae).** *Molecular Ecology* 12: 2331-2343.

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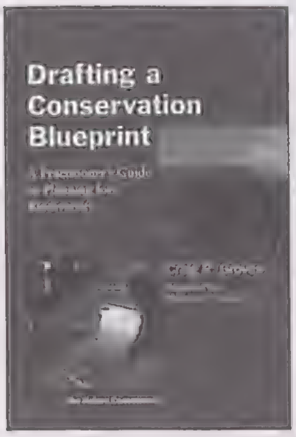
Publications and Information Resources



Drafting a Conservation Blueprint: A practitioner's guide to planning for biodiversity

Craig R. Groves, 2003, Island Press

This publication presents a step-by-step planning process for conserving the biological diversity of entire regions. The author explains how to develop a regional conservation plan and offers experience-based guidance that brings together relevant information from the fields of ecology, conservation biology, planning, and policy. 457 pages, $US35 (paperback),

To order visit http://www.islandpress.com/books/

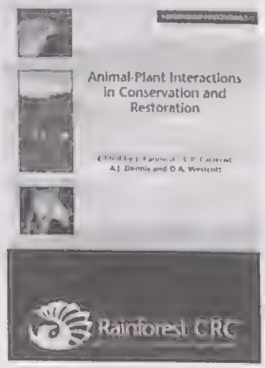
Animal-Plant Interactions in Conservation and Restoration: Research Report No. 29

Edited by J. Kanowski, C.P. Catterall, A.J. Dennis and D.A. Westcott, 2004

The proceedings of a workshop held at the 2003 Rainforest Cooperative Research Centre Conference in Cairns, November 2003, are now available. The publication includes a range of papers and summaries of workshop discussions and will be useful for a variety of readers including students, management and restoration practitioners, researchers and interested individuals.

$25 (GST inclusive). To obtain a copy contact the editors at: J.Kanowski@griffith.edu.au

or visit the CRC website at http://www.rainforest-crc.jcu.edu.au/publications/


Animal-Plant Interactions in Conservation and Restoration
A.J. Dennis and D.A. Westcott
Rainforest CRC

Plants in Changing Environments: Linking physiological, population, and community ecology (2nd edition)

F. A. Bazzaz. February 2004. Cambridge University Press

Human intervention and forces of nature lead to innumerable local, regional and sometimes global changes in plant community patterns. Irrespective of the causes and the intensity of change, ecosystems are often able to recover most of their attributes through natural succession. With the heightened interest in the fate of the biosphere, the emphasis on sustainable development worldwide and the possible consequences of global climate change, the study of succession and ecosystem recovery takes on added urgency. Successional theory will play a major role in ecosystem preservation, management and restoration. This updated new edition continues to provide a wealth of information on how disturbance changes the environment, how species function, coexist, and share or compete for resources in populations and communities, and how species replace each other over successional time.

ISBN: 0521533058, 354 pages
Available from Cambridge University Press:
http://books.cambridge.org/0521533058.htm

Name That Flower. The identification of flowering plants (2nd edition)

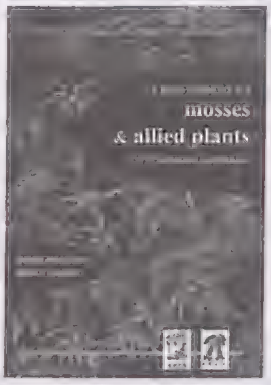
Ian Clarke and Helen Lee. November 2003. Melbourne University Press

For over fifteen years, *Name That Flower* has provided thousands of serious gardeners and keen botanists, professional and amateur, with a wonderfully clear, concise guide to identifying flowering plants cultivated and in the wild, Australian and worldwide. It has been used extensively as a teaching text in numerous courses concerned with the natural world such as agriculture, botany, environmental management, horticulture and landscape design. And now, after being reprinted 10 times, this essential work has been extended and updated.

Profusely illustrated with over 130 detailed line drawings and twelve pages of colour plates, this book introduces the reader to the arrangement of flowers on plants, reproduction, plant structure and function, and the way plants are grouped and named. Methods for dissecting flowers and observing their structure for identification purposes are clearly described. A comprehensive glossary and up-to-date bibliography provide a welcome guide to further information.

ISBN 0-522-85060-X, 344 pp

Order from Melbourne University Press at http://www.mup.unimelb.edu.au/



A Field Guide to the Mosses and Allied Plants of Southern Australia: Flora of Australia Supplementary Series, Number 20

D. Meagher & B. Fuhrer. 2003. Australian Biological Resources Study/The Field Naturalists Club of Victoria

A richly illustrated, full-colour identification guide to almost 500 mosses, liverworts and hornworts in southern Australia. The book includes an introduction to the bryophytes, information on the collection, storage and naming of specimens, identification keys, descriptions, thumbnail anatomical sketches and more than 250 beautiful colour photographs (mostly half-page).

ISBN 0 642 56828. $48. Order from the Commonwealth Department of Environment and Heritage at Tel: (02) 6250 9435 or http://www.deh.gov.au/biodiversity/abrs/publications/order/index.html

The Victorian Naturalist

Volume 120(6) Biodiversity Symposium Special Issue December 2003. Field Naturalists Club of Victoria

Contains five papers from an FNCV symposium entitled: *A Review of the Victorian Flora and Fauna Guarantee (FFG) Act–14 years since implementation.* A. Moorrees: *Victoria's FFG Act: a perspective from the Department of Sustainability and Environment.* P. Sutton: *Has the FFG Act achieved what we hoped for?* A. Walker: *The Victorian FFG Act–a toothless Tiger Quoll?* G. Wilson: *Implementation of the Threatened Species Conservation Act in NSW*; and T. May, T. New, N. Walsh & A. Yen: *The Victorian FFG Act and the conservation of lesser known groups of biota.*

There are many suggestions in these papers as to how the Victorian FFG Act might be improved, both by additional powers, and by better implementation.

Available from Field Naturalists Club of Victoria, Locked Bag 3, PO Blackburn 3130 (fncv@vicnet.net.au). $5.50, plus postage ($3.00 or $4.00 outside Victoria).

ISSN 0042-5184.

Prospects for Biodiversity in Salinising Landscapes

Australian Journal of Botany, *Special Issue Volume 51 Number 6 December 2003*

Papers in this special issue of the *Australian Journal of Botany* refer to salinising landscapes in Australia where salt is accumulating at toxic concentrations in soils, rivers and wetlands. The 13 papers were presented to a recent conference in Albany in the south-west WA on the 'Prospects for biodiversity and rivers in salinising landscapes'.

Available from CSIRO Publishing at http://www.publish.csiro.au/ Price: $75.

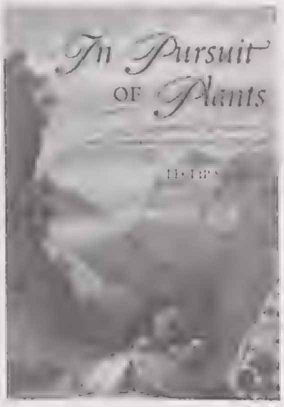
Weed Categories for Natural and Agricultural Ecosystem Management

Groves, R.H. et al., 2003. Commonwealth of Australia

Introduced plants that have become naturalised in Australia are said to now comprise about 10 percent of the national total flora. Many of these species affect biodiversity, competing with and altering the habitat of native plants and animals, even threatening survival of some stressed species. *Weed Categories for Natural and Agricultural Ecosystem Management* categorises 2700 non-native plant species as falling into groups of major or minor threats to both natural and agricultural ecosystems. You can download the 200 page book at http://www.affa.gov.au/corporate_docs/publications/pdf/rural_science/lms/weeds/brs_weeds.pdf.

In Pursuit of Plants: Experiences of nineteenth & early twentieth century plant collectors

Philip Short. November 2003. University of Western Australia Press



In Pursuit of Plants, Philip Short's fascinating book, compiles nearly forty first-hand accounts by nineteenth and early twentieth century plant collectors of their pursuit of plant specimens from around the world. Many of the narratives read like adventure stories. They offer insights into a lost world and the challenges and practical problems of plant collecting. All are extracts from journals and letters and some are published here for the first time.

Philip Short is a taxonomist at the Northern Territory Herbarium. He has extensive research experience and has published over forty papers and two books. *In Pursuit of Plants* includes a selection of nineteenth century botanical art and modern photographs, notes about the collectors and commentary on the plants they gathered.

ISBN 1 876268 98 0, HB, $54.95 (includes GST), 352 pages Available in most bookstores nationally.

Electronic Addresses

Flora of Australia Online

ABRS has developed the Flora of Australia online website to access taxonomic treatments of Australian plants. Australia and its external Oceanic Islands are covered in three separate websites:

- Information for 50 families extracted from 11 volumes of the main Flora of Australia book series is currently available at http://www.deh.gov.au/biodiversity/abrs/online-resources/abif/flora/main/ More volumes will be added in the future.
- The flora of Norfolk and Lord Howe Islands, covering 136 families, is available at http://www.deh.gov.au/biodiversity/abrs/online-resources/abif/flora/49/
- The flora of the remaining Australian Oceanic Islands, covering 113 families, is online at http://www.deh.gov.au/biodiversity/abrs/online-resources/abif/flora/50/

IUCN/SSC Orchid Specialist Group's Website

The World Conservation Union's Species Survival Commission's Orchid Specialist Group has launched its new website, which provides details about the group, publications, funding opportunities, news, international events and useful links. The group advocates an integrated approach to orchid conservation, using both in situ and ex situ methods, including habitat management, sustainable use, seed banking and reintroduction. Educating the orchid community and general public about the threats to orchids and viable solutions is critical to the success of conservation projects. Visit the website to find out more.

Go to http://go.to/orchid-specialist-group

Science Image Online

Science Image Online is an image library specialising in science and nature, presented by CSIRO.

Go to http://www.scienceimage.csiro.au for more information

A Prototype Toolkit for Scoring the Biodiversity Benefits of Land Use Change

Successful management of native vegetation by land users is vital for ensuring the health and survival of biodiversity in south-eastern Australia. With this 'toolkit', land holders can assess the costs and benefits, for biodiversity, of different land use practices. The toolkit aims to:

- Score the current biodiversity of a site;
- Estimate the magnitude and direction of change in biodiversity value resulting from land use change; and
- Incorporate these current and potential values into a Biodiversity Benefits Index.

The document can be downloaded at http://www.dlwc.nsw.gov.au/care/biodiversity_toolkit.pdf

Wetland Care Australia

Wetland Care Australia has recently updated its website to including information on wetland rehabilitation and restoration around Australia.

See http://www.wetlandcare.com.au

Global Orchidaceae Checklist

Over the past three years, the Monocot Checklist Project at the Royal Botanic Gardens, Kew, has been aiming to create a global checklist of all monocot families. One of the latest families to be completed is Orchidaceae. This orchid checklist includes about 24,000 accepted species and 65,000 names in total. The data included are name, place of publication, synonymy, and global distribution. The data follow the generic concepts of *Genera Orchidacearum* and are part of a wider project meant to bring together knowledge and information on plant species. This electronic plant information centre (ePIC) will eventually provide illustrations, local uses, molecular data, conservation ratings, and much more.

The whole checklist is currently available on the Internet as a text file (http://www.rbgkew.org.uk/data/monocots/). By the end of the year the data will be available as a searchable database. Searches will be possible on the different elements of the checklist so that, for example, regional lists can be made. Such regional lists may be helpful in trying to determine plants from particular areas or for assessing the conservation status of a taxon in a particular region.

Conferences & Workshops, Courses & Fieldwork

Workshop on the Translocation of Threatened Plants

4th June 2004, Royal Botanic Gardens, Sydney

Due to popular demand, the Australian Network for Plant Conservation presents this repeat workshop, aimed at anyone involved in the planning, approval or implementation of a translocation project for threatened flora. For details of the workshop content, see the back page of this bulletin, plus the article on page 11.

Registrations due by Friday 27th May.

ANPC members: $85, non-members: $115

For more information contact the ANPC National Office (details on page 1 of this bulletin)

5th Australian Native Seed Biology & Seed Provenance workshops

21-22 June, Brisbane

Organised by the Australian Centre for Mining Environmental Research (ACMER). Major topics include seed ecology, seed production and quality, seed storage, dormancy and germination, establishment and management, etc. A provenance workshop is also planned to be run prior to the Native Seed Biology workshop. Fees to be announced.

For further information on the workshop, visit:

http://www.acmer.com.au/training/attachments/ or contact Megan Whitta, ACMER Course Coordinator, PO Box 883, Kenmore Qld 4069; phone 07 3327 4655, fax 07 3327 4574, email acmer@uq.edu.au

Habitat Conservation and Management 2004

July 2004, Greening Australia

A course for those with responsibility for managing a habitat, or those simply interested in habitat management and conservation. The Habitat Conservation and Management Course consists of 15 weekly information sessions and seven field trips. The course is focused on all aspects of bushland ecology (including geology, soils, climate, flora, invertebrates, mammals etc) and understanding systems before attempting to manage them. It regularly challenges previous practices and replaces them with simple practical alternatives.

Presenters include: Randall Robinson, Darcy Duggan, Alan Yen, Kate Bennetts, Jason Horlock and Andrew Bennetts. Cost: $880 (or only $220 if you qualify for the FarmBis subsidy).

For more information call Benita (Greening Australia) on (02) 9450 5321.

NSW Regional Botanic Gardens Conference 2004

14-16th May 2004, Clover Hill Function Centre, Orange Botanic Gardens, NSW

The conference is organised around the themes of design, education and community. The conference program combines formal presentations from speakers such as Dr Tim Entwisle (Acting Director, Botanic Gardens Trust, Sydney), with informal periods to allow for discussion.

For details visit http://www.orange.nsw.gov.au
or contact Jane Arnott: Ph: 6362 0276
email: jarnott@netconnect.com.au

Key Centre for Biodiversity and Bioresources Macquarie University. 2004 Seminar Series

Dept. of Biological Sciences, North Ryde, Sydney, NSW

A series of seminars on the following topics:

- 21st May, Steve Cork, Research and Development, Land and Water Australia: *The future for ecosystem services – impact for biodiversity.*
- 11th June, Ross Bradstock, Policy and Science Division, NSW Department of Environment and Conservation: *Contemporary bushfire management – myths and realities.*
- 16th July, Tish Silberbauer, Key Centre for Biodiversity and Bioresources, Macquarie University: *Ecosystem services in the Gwydir Valley – beyond the buzzwords.*
- 31st August, Peter Price, Department of Biological Sciences, Northern Arizona University, USA: *The Phylogenetic Constraints Hypothesis: an evolutionary approach to population dynamics*

Enquiries: Professor Andrew Beattie. Ph: 02 9850 8153
Email: abeattie@bio.mq.edu.au

ANPC Regional Groups

The ANPC has several Regional Groups which play a key role in bringing together those with an interest or involvement in plant conservation to share information through activities organised in their regions. The groups enable efficient communication of best practice information on plant and ecological community conservation to be spread to agencies and groups active in on-ground works. The Regional Groups are coordinated by voluntary coordinators, and activities include seminars and workshops, field days and practical activities such as threatened plant surveys and weeding. Find out where your nearest local group is and join in their activities. If you do not have a regional group nearby, then perhaps you might like to set one up! If so, contact us at National Office and we will be happy to support you.

Melbourne Region: Bill Richdale. Ph: 03 9440 6291 Email: richdale@optushome.com.au.

Sydney Region: Tracey Armstrong, Mount Annan Botanic Garden. Ph: 02 4634 7939
Email: Tracey_Armstrong@rbgsyd.nsw.gov.au

Illawarra and South Coast NSW Region: Paul Formosa, Wollongong City Council. Ph: 02 4225 2638
Email: pformosa@wollongong.nsw.gov.au
Roger Hart, Booderee Botanic Garden, Jervis Bay. Ph: 02 4442 1122 Email: roger.hart@ea.gov.au

NSW South West Slopes: Paul Scannell, Albury Botanic Gardens. Ph. 02 6023 8769
Email: pscannell@alburycity.nsw.gov.au

Tasmania: Andrew Smith, Parks and Wildlife Service Tasmania. Ph: 03 6233 2836
Email: andrew.smith@dpiwe.tas.gov.au

NSW South West Slopes Group

Paul Scannell

NPWS Crimson Spider Orchid Recovery Plan

The NSW National Parks and Wildlife Service's Recovery Plan for the Caladenias will hopefully be approved early this year and we are set for a busy program of activities with many groups involved, including the Department of Sustainability and Environment Victoria, Royal Botanic Gardens Melbourne, NSW NPWS, the Albury Botanic Gardens and community members. Seed baiting trials, DNA analyses to compare populations and ex situ propagation will all be carried out through a collaborative approach between the Victorian Multi Species Orchid Recovery Team and the NPWS Caladenia Recovery Team.

Community bush survey

The Community Bush Survey was held on September 20th and 21st last year on Nail Can Hill in Albury and was a huge success, with over 70 volunteers participating in the three night–two day survey. Five threatened species (growling grass frog, pink tailed worm lizard, crimson spider orchid, black chinned honeyeater and nobbi dragon) were found and over 70 quadrats were recorded by GPS for later monitoring. The students from the National Environment Centre at Thurgoona campus of the Riverina TAFE did a fantastic job co-ordinating all aspects of the survey, including developing a management report for AlburyCity.

Illawarra and South Coast NSW Group

Paul Formosa

Mapping, field assessments and confirmation of endangered ecological communities (EECs) within local government areas is a requirement under the NSW Local Government Act. This is a pre-requisite prior to categorising these as sites of cultural significance as well as developing management plans for them.

Wollongong City Council is seeking assistance from the University of Wollongong Environmental Science Program to approve an Honours research project to find and assess endangered ecological communities occurring on community land within the Wollongong Local Government Area.

Whilst previous studies have identified the possible locations of EECs, the information obtained is limited in its accuracy and requires scientific field assessment to accurately confirm the presence of EECs. The objectives of the proposed study are therefore to:

- Review available scientific information (e.g. Scientific Committee determinations, consultants' reports, NPWS studies etc.) to help confirm the presence of an EEC.
- Undertake detailed vegetation surveys of community lands
- Confirm the presence of EECs on community land within the Wollongong LGA according to the Threatened Species Conservation Act (1995)
- Provide an overview of the habitat condition at each site
- Document any observed/proposed/known impact at each site

In the first year of the project it is expected that all sites of potential Sydney Coastal Estuarine Swamp Complex will be evaluated, as well as one other EEC. The work associated with this project including field work, laboratory/office work, data presentation, analysis and writing will be supervised by Associate Professor Kris French from the School of Biological Sciences and Paul Formosa, Natural Areas Coordinator at Wollongong City Council.

For more information please contact: Paul Formosa, Wollongong City Council, Ph: 02 4225 2638.
Email: pformosa@wollongong.nsw.gov.au

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CITY OF GREATER GEELONG

Royal Botanic Gardens Victoria
RBG00023376

Due to popular demand

Australian Network for Plant Conservation

presents a repeat workshop on

THE TRANSLOCATION OF THREATENED PLANTS

Friday 4th June 2004

Venue: Maiden Theatre, Royal Botanic Gardens, Sydney, New South Wales

Have you been involved in, or would you like to be involved in, the planning, approval or implementation of a translocation project for threatened flora? Then this workshop is relevant to you!

Questions to be addressed include:

- What is translocation?
- When is it appropriate to use translocation as a tool to conserve threatened species?
- What needs to be done when planning a translocation program?
- How should a translocation program be implemented?
- What ongoing management and evaluation is required?
- Where can I go for more information?

The workshop will include case studies of translocation programs, highlighting lessons to be learnt. Participants will be provided with a copy of the ANPC's second edition of *Guidelines for the Translocation of Threatened Plants.*

Translocation is one of the many tools available to assist in conserving threatened plant species. It involves the deliberate transfer of plants or regenerative plant material from one place to another. Translocation can be used to enhance existing populations; reintroduce a species to a site where it formerly occurred, but where it is now extinct; and to introduce a species to a site where it hasn't been recorded previously.

Registrations due by Friday 27th May 2004

ANPC members $85

Non-members $115

Botanic Gardens Trust
SYDNEY

This Project has been assisted by the New South Wales Government through its Environmental Trust

Environmental TRUST

Registrations open now - see form inside

Australasian Plant Conservation
BULLETIN OF THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION

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